

# SAN DIEGO PLASTICS, INC.

## NORYL®

*is a low density foam*

**PPO, PPE (Modified Polyphenylene Oxide and Polyphenylene Ether)**

### PROPERTIES

Very good physical properties

Good heat resistance

Poor chemical resistance

Very stable dimensionally

Poor color stability

Opaque

Moderate price

Somewhat tough processing

Long term dimensional stability

Superior impact strength

Wide range of UL flammability ratings from UL94 HB to UL94 V-1 Noryl exhibits a continuous use temperature in excess of 220 ° F.

Thermoformable capability

Possesses good hydrolytic stability

### LIGHT WEIGHT:

Noryl with a density of 0.0383 lbs/inch<sup>3</sup> can be used in applications where weight is a serious consideration.

*6.6 lb/ft<sup>3</sup>*

### GOOD ELECTRICAL INSULATING PROPERTIES:

Due to its extremely low water absorption with values as low as 0.07%, Noryl is an excellent insulating material.

### APPLICATIONS

Internal appliance components

Brackets and structural components in office products

Large computer and printer housings (painted, formed)

Automotive wheel covers, plated

High tolerance electrical switch boxes and connectors

Noryl exhibits a broad range of outstanding properties for applications in computers and business equipment, automotive, electrical insulation, telecommunications, electronics and many other industries.

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Modified polyphenylene oxide and polyphenylene ether resins are similar in chemical composition and properties and will be discussed as one class of resins. The modification of these resins involves blending with a second polymer usually polystyrene or polystyrene/butadiene. By varying the blend ratio and other additives, a variety of grades are produced. Unmodified, these polymers are characterized by regular closely spaced ring structures (phenyl groups) in the main molecular chain. This feature along with strong intermolecular attraction causes extreme stiffness and lack of mobility.

Their low molecular polarity gives them very low water absorption. Melt processing of the unmodified polymer is extremely difficult. These features lead to: high strength, high modulus, excellent dimensional stability, very good impact resistance, and high thermal distortion resistance. The modified polymers retain these properties to a significant degree. Both modified and unmodified versions are attacked by many chlorinated and aromatic solvents.

Modified PPO and PPE resins are commonly used as structural foam and can be easily electroplated. Their strength, stability, and the fact that they accept flame retardants well makes them desirable for machine and appliance housings. Their lack of chemical resistance and poor color stability means that they often have to be painted in these applications. Low water absorption leads to their use in many water handling products, such as water pump components, plumbing fixtures, and electric irons. Electroplated, these resins are used in automotive wheel covers and grills, for their high strength and impact resistance. Dimensional stability especially in moist environments, has given modified PPO's and PPE's a share of the electrical switch block, connector, and housing market.

New grades of PPO and PPE have been introduced with improved chemical resistance and wear properties. Blending with polymers other than polystyrene and using PTFE additives have resulted in this broadening of property profiles. To date attempts to bring their color stability to the level of other housing resins, like polycarbonate and ABS, have been unsuccessful.

**PRODUCT DESCRIPTION :** Polyphenylene Oxide, Black

**PRIMARY SPECIFICATION :** ASTM D-4349 PPE220B50541 F13G1106

**BASE RESINS TRADE NAMES :** Noryl®

**MECHANICAL PROPERTIES:**

Specific gravity (ASTM D 792) : 1.06

Tensile strength, Ultimate (ASTM D 638) : 9,600 p.s.i.

Elongation at break (ASTM D 638) : 30%

Tensile modulus (ASTM D 638) :  $3.5 \times 10^5$  p.s.i.

Rockwell hardness (ASTM D 785) : R119

Impact strength (73° F) (ASTM D 256) (notched) : 5.0 ft-lb/inch

Flexural strength (ASTM D 790) : 13,500 p.s.i.

Flexural modulus (ASTM D 790) :  $3.6 \times 10^5$  p.s.i.

Wear factor against steel 40 psi 50fpm :  $3000 \times 10^{-10}$

Coefficient of friction 40psi 50fpm : 0.39 Dynamic

**THERMAL PROPERTIES:**

Melting point (Vicat Softening Temperature) : 310° F

Heat deflection at 66 psi (ASTM D 648) : 279° F

Heat deflection at 264 psi (ASTM D 648) : 265° F

Maximum serving temperature for short term : 230° F

Maximum serving temperature for long term : 220° F

Thermal conductivity (ASTM C 177) : 1.32 Btu-inch/hr-ft-2- ° F

Specific heat : 0.30 Btu/lb- ° F

Coefficient of linear thermal expansion (ASTM D 696) :  $3.3 \times 10^{-5}$

Applicable temperature range for thermal expansion : 0-140° F

**ELECTRICAL PROPERTIES:**

Dielectric constant at 60Hz (ASTM D 150) (73° F, 50% RH) : 2.7

**Dissipation factor at 60Hz (ASTM D 150) (73° F) : 0.001**

**Volume resistivity (ASTM D 257) : 10~17 ohm-cm**

**Dielectric strength (ASTM D 149) : 500 v/MIL**

**MISCELLANEOUS:**

**Water absorption - 24 hours (ASTM D 570) : 0.07%**

**Water absorption - saturation (ASTM D 570) : 0.20%**

**Density (ASTM D 792) : 0.0383 lb/inch~3**

**Flammability (UL 94) : V1**

**Weathering Resistance : Yes**



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